The Development of the Pupa and Fly within the Larva; The Pupa of Chironomus; and The Embryonic Development of Chironomus. To this is added a brief appendix on methods, likewise intended to promote the use of Chironomus as a laboratory subject. The numerous figures are well selected and useful, but in their execution the best of them do not rise above mediocrity.

Incidentally there is described (on page 34) and figured the larva of Clinocera (Fam. Empididæ), a new type of dipterous larva with eight pairs of prominent abdominal prolegs. J. G. N.

**Reactions of Protozoa.** — In the Supplementband for 1900 of the *Archiv für Anatomie und Physiologie*, August Pütter[1] presents a most valuable contribution to our knowledge of the reactions of unicellular organisms. The fact that the reactions of these creatures to various stimuli are profoundly modified when the organism is in contact with a solid, is strikingly evident to any one that has studied the behavior of the Protozoa. Pütter has subjected to a thorough analysis this effect of contact of solids (thigmotaxis) and its interference with the operation of other stimuli, and the results form a contribution, an acquaintance with which is indispensable to all who wish to obtain an understanding of the behavior of these creatures. Exact observation of the actual movements of the organisms, close attention to the interrelation of structure and function, and careful analysis of the various factors involved, form the striking and valuable features of the paper, which stands in refreshing contrast in this respect to some of the recent papers dealing with the reactions of lower organisms. The paper is so full of detail, and casts light on so many observed phenomena, that it is impossible to give an idea of the results in a brief notice. In addition to a precise account of the thigmotactic reaction itself, the author deals particularly with the reactions to heat and to the electric current, as modified by the thigmotactic reaction. The observations on electrotaxis are in accord, in all essentials, with those set forth by Pearl in the *American Journal of Physiology* for July, 1900, and throw some additional light on this subject, especially on the subject of *transverse* electrotaxis. Attention may be further called to the fact that Pütter confirms for many Infusoria the method of reaction to a stimulus by turning toward a structurally defined side, as described by the reviewer.

[1] Pütter, August. Studien über Thigmotaxis bei Protisten, *Archiv für Anatomie und Physiologie*, Physiologische Abteilung, Supplementband, 1900, pp. 243–302.

By the work of Pütter another of the reactions of these organisms — thigmotaxis — is placed on a satisfactory scientific basis, and light is thrown on many other phenomena. H. S. J.

**Notes.** — Burchardt's recent article (*Jenaische Zeitschrift*, Bd. XXXIV, pp. 719–882) on the body spaces and connective tissue of Amphioxus is of general interest because of the accompanying bibliography, which is intended to be complete for this important and much studied animal. The list is arranged chronologically and includes some six hundred references. One is reminded of Baedeker on finding that important papers are indicated by an asterisk.

Metcalf ("Notes on the Morphology of the Tunicata," *Zoologische Jahrbücher*, Bd. XIII, 1900, pp. 495–602, Heft IV) gives us a paper extending over a wide range of morphological and systematic topics. A brief notice like the present one cannot mention all the results of interest contained in such a paper as this. Among them the following are perhaps the most important: The homology of the vertebrate hypophysis and the neural gland of the Tunicata is a "suggestion the truth of which, while it may be probable, is still insufficiently established." Reëxamination of the structure of the interesting deep-sea genus Octacnemus leads to the conclusion that its affinities are with those simple ascidians that reproduce by budding, rather than with the Salpidae, as supposed by Herdeman. It is proposed to institute a family, the Octacnemidæ, for it. A new species of the molguloid genus Bostrichobranchus, *viz.*, *B. molguloides*, is described.

A contribution to the postembryonal development of Molgula is made by Marc de Selys-Longchamps and D. Damas (*Arch. de Biologie*, Tome XVII, 1900, pp. 385–483). The development of the stigmata is studied with special care. Six pairs of protostigmata are recognized, the first two pairs forming simultaneously. The later multiplication and coiling up of the stigmata and the formation of the infundibulæ are followed out. The larval sense organ is found to persist into adult life in *M. ampulloides*. The study of the development of the sexual glands leads to the conclusion that there is no bilateral symmetry in the disposition of the germinative epithelium.

In studies on some distomes, Jacoby describes (*Arch. f. Naturges.*, Bd. I, 1900) a species, *Distomum heterolecithodes* Braun, which is remarkable for the fact that the vitelline gland, which is usually symmetrical, is developed only on one side of the body. In eleven cases studied the organ was sinistral, while in four the author found